

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A monitoring unit for monitoring the condition of a semi-permeable membrane, the monitoring unit comprising a flow chamber having ~~an a feed fluid inlet for permitting ingress of a feed fluid into the flow chamber;[[,]] the arrangement being such that the membrane is at least partly supported in the flow chamber: a fluid permeable support member for supporting a semi-permeable test membrane in the flow chamber, the support member constituting a base portion of the flow chamber such that feed fluid entering the flow chamber passes at least in part through the support member; at least one fluid outlet arranged in fluid communication with the flow chamber for permitting egress of fluid from the monitoring unit after having passed through the test membrane; and an inspection window for permitting visual inspection of the semi-permeable test membrane, the inspection window being oriented substantially parallel to and spaced from the support member such that the flow chamber is defined intermediate the support member and the inspection window; the monitoring unit being located in-line with a reverse osmosis water purification system intermediate a feed fluid tank and a membrane plant for monitoring fouling of the semi-permeable membrane in the reverse osmosis water purification system.~~
~~an a feed fluid inlet for permitting ingress of a feed fluid into the flow chamber;[[,]] the arrangement being such that the membrane is at least partly supported in the flow chamber: a fluid permeable support member for supporting a semi-permeable test membrane in the flow chamber, the support member constituting a base portion of the flow chamber such that feed fluid entering the flow chamber passes at least in part through the support member; at least one fluid outlet arranged in fluid communication with the flow chamber for permitting egress of fluid from the monitoring unit after having passed through the test membrane; and an inspection window for permitting visual inspection of the semi-permeable test membrane, the inspection window being oriented substantially parallel to and spaced from the support member such that the flow chamber is defined intermediate the support member and the inspection window; the monitoring unit being located in-line with a reverse osmosis water purification system intermediate a feed fluid tank and a membrane plant for monitoring fouling of the semi-permeable membrane in the reverse osmosis water purification system.~~
2. (Canceled)
3. (Canceled)

4. (Previously presented) The monitoring unit according to claim 1 further including a feed fluid outlet and wherein the flow chamber is dimensioned such that a fluid pressure interval is defined intermediate the feed fluid inlet and the feed fluid outlet.

5. (Currently amended) The monitoring unit according to claim 4 wherein the fluid pressure at the feed fluid outlet is less than that at the feed fluid inlet such that, in use, the feed fluid partly exits through the feed fluid outlet of the flow chamber and in part passes through the semi-permeable test membrane.

6. (Canceled)

7. (Canceled)

8. (Currently amended) The monitoring unit according to ~~either claim 6 or claim 7~~ claim 1 wherein the support member is made of any suitable porous material such as a high-density polyethylene, stainless steel, brass, or finely woven fiber porous material.

9. (Currently amended) The monitoring unit according to claim 8 wherein the support member ~~include~~ includes pores of pore sizes between 10 and 150 μm .

10. (Currently amended) The monitoring unit according to claim 1 wherein the monitoring unit includes spacer means for spacing the semi-permeable test membrane from the support member so as to provide a flow space between the test membrane and the support member.

11. (Currently amended) The monitoring unit according to either claim 10 or claim 45 wherein the monitoring unit accommodates different spacer means that vary in thickness and shape, the arrangement being such that fluid dynamics of the feed fluid

flowing across the semi-permeable test membrane are influenced through the use of different spacer means.

12. (Currently amended) The monitoring unit according to claim 11 wherein the spacer means is a spacer that is locatable intermediate the semi-permeable test membrane and the support member.

13. (Previously presented) The monitoring unit according to claim 10 wherein adsorption kinetics of fouling substances in the feed fluid are affected by specific spacer configurations, the monitoring unit thus including the potential for evaluating spacer technology because of its potential to include different types of spacers.

14. (Currently amended) The monitoring unit according to claim [[6]] 4 wherein the fluid outlet is arranged in fluid communication with the support member such that fluid that has passed through the test membrane and the support member exits the monitoring unit through the fluid outlet.

15. (Previously presented) The monitoring unit according to claim 14 wherein the fluid outlet is arranged in fluid communication with a conduit for passing the fluid through the water purification system.

16. (Canceled)

17. (Currently amended) The monitoring unit according to claim 16 1 wherein the inspection window is made of any suitable transparent a plastic, Perspex, or glass material, characterized therein that it can withstand a pressure of at least between 40 and 50 bar.

18. (Currently amended) The monitoring unit according to claim 1 wherein the monitoring unit includes regulating means for regulating flow across the test membrane,

as well as fluid pressure in the unit, the regulating means being adapted to permit repeatable or standard conditions, such as a constant cross-flow velocity and fluid pressure.

19. (Previously presented) The monitoring unit according to claim 18 further including a feed fluid outlet and wherein the regulating means is at least one valve arranged for regulating the fluid pressure interval intermediate the feed fluid inlet and the feed fluid outlet.

20. (Previously presented) The monitoring unit according to claim 19 wherein the monitoring unit includes at least one feed fluid inlet valve operatively associated with the feed fluid inlet; and at least one feed fluid outlet valve operatively associated with the feed fluid outlet of the flow chamber.

21. (Previously presented) The monitoring unit according to either claim 19 or claim 20 wherein the monitoring unit includes at least one fluid outlet valve at the fluid outlet.

22. (Previously presented) The monitoring unit according to claim 1 wherein the monitoring unit is operatively associated with pumping means for further manipulating fluid pressure in the monitoring unit.

23. (Previously presented) The monitoring unit according to claim 22 further including a feed fluid outlet and wherein the monitoring unit is operatively associated with a positive displacement pump arranged in-line with the monitoring unit and suitable for maintaining the fluid pressure interval intermediate the feed fluid inlet and feed fluid outlet of the flow chamber.

24. (Previously presented) The monitoring unit according to claim 1 wherein the monitoring unit includes flow distribution means in the form of a manifold dimensioned for preventing turbulence within the flow chamber and for effecting homogenous fluid flow.

25. (Previously presented) The monitoring unit according to claim 24 wherein the monitoring unit includes an inlet manifold arranged intermediate the feed fluid inlet and the flow chamber for regulating flow of feed fluid into the flow chamber.

26. (Previously presented) The monitoring unit according to claim 24 wherein the monitoring unit includes a feed fluid outlet and an outlet manifold located intermediate the flow chamber and the feed fluid outlet, the outlet manifold being arranged such that it prevents areas of decreased flow in the flow chamber so as to prevent preferential foulant adsorption or biological growth.

27. (Currently amended) The monitoring unit according to either claim 25 or claim 26 wherein the manifolds are arranged so as to permit reverse flow through the monitoring unit for evaluating the effectiveness of back flushing on removal of impurities adsorbed onto the test membrane.

Claims 28 and 29 Canceled.

30. (Currently amended) The monitoring unit according to claim [[1]] 10 wherein the monitoring unit comprises the potential of simulating, in the monitoring unit, conventional fluid dynamics associated with [[a]] the semi-permeable test membrane across the spacer means and support member and is therefore adapted for monitoring fouling of [[a]] the semi-permeable membrane during operation of [[a]] the water purification system.

31. (Currently amended) The monitoring unit according to claim 30 wherein the monitoring unit operates at a fluid pressure ~~corresponding to that of the water purification system, and more particularly at a fluid pressure of between 40 and 50 bar.~~

32. (Canceled)

33. (Currently amended) The monitoring unit according to claim 32 1 wherein the monitoring unit is adapted for monitoring fouling of a semi-permeable spiral membrane in a spiral reverse osmosis water purification system and is located intermediate a feed fluid tank and a spiral membrane plant of the spiral reverse osmosis water purification system.

34. (Previously presented) A method of monitoring fouling of a semi-permeable membrane in a water purification system, the method comprising the steps of providing a monitoring unit comprising a flow chamber having an inlet for permitting ingress of a feed fluid into the flow chamber, at least one fluid outlet arranged in fluid communication with the flow chamber for permitting egress of fluid from the monitoring unit after having passed through a semi-permeable test membrane; and an inspection window for permitting visual inspection of the semi-permeable test membrane; placing the semi-permeable test membrane on a fluid permeable support member; effecting at least partial passage of feed fluid through the test membrane; and visually monitoring fouling of the test membrane through the inspection window as an indicating means for determining fouling of the semi-permeable membrane in the water purification system.

35. (Currently amended) The method according to claim 34 wherein the method comprises the step of effecting at least partial passage of feed fluid through the test membrane ~~under conventional system operating conditions~~ such that fouling of the

semi-permeable membrane is monitored during operation of the water purification system.

36. (Previously presented) The method according to either claim 34 or claim 35 wherein the method particularly concerns monitoring fouling of a semi-permeable spiral membrane in a spiral reverse osmosis water purification system.

37. (Previously presented) The method according to claim 34 wherein the test membrane is removably placed on the support member and is spaced from the support member by means of spacer means.

38. (Previously presented) The method according to either claim 34 or claim 37 wherein the test membrane is any suitable flat-sheet semi-permeable membrane associated with a polymeric support material used in the monitoring unit.

39. (Previously presented) The method according to claim 34 wherein fouling of the test membrane is also monitored by means of monitoring equipment, selected from the group consisting of laser beam or infrared refraction, or sound acoustics.

40. (Previously presented) The method according to claim 34 wherein flux or passage of pure water through the semi-permeable test membrane is measured by maintaining flow and pressure constant through the monitoring unit, the arrangement being such that any deviation in the flux through the test membrane is attributable to adsorption of impurities onto the test membrane, which changes the permeability characteristic of the test membrane.

41. (Currently amended) The use of a monitoring unit including a semi-permeable test membrane for evaluating, by visual and physical inspection, one or more of the following operating parameters in a water purification system, namely the

efficiency of different types of chemicals utilized in the system, the effect of using different membranes and/or associated spacer means in the water purification system on the operating efficiency of the system[[;]], and efficiency of different membrane cleaning methods wherein the monitoring unit is located in-line with the water purification system; placing the semi-permeable test membrane on the fluid permeable support member, and effecting at least partial passage of feed fluid through the test membrane to stimulate operating conditions of the water purification system in the monitoring unit and the operating conditions of the water purification system are simulated in the monitoring unit.

42. (Previously presented) The use of a monitoring unit for evaluating, by visual and physical inspection, one or more of the following parameters in a spiral membrane reverse osmosis water purification system, namely: fouling of the spiral membrane; the efficiency of different types of chemicals utilized in the system, the effect of using different membranes and/or associated spacer means in the water purification system on the operating efficiency of the system; and efficiency of different membrane cleaning methods, wherein the monitoring unit comprises a flow chamber having an inlet for permitting ingress of a feed fluid into the flow chamber, the arrangement being such that a test membrane is at least partly supported in the flow chamber; at least one fluid outlet arranged in fluid communication with the flow chamber for permitting egress of fluid from the monitoring unit after having passed through the test membrane; and an inspection window for permitting visual inspection of the test membrane, the use being characterized in that the monitoring unit is located in-line with the spiral membrane

reverse osmosis water purification system and the operating conditions of the water purification system are simulated in the monitoring unit.

43. (Currently amended) A water purification system including at least one water-cleaning unit, the water purification system characterized therein that it includes a monitoring unit that comprises ~~a flow chamber having an inlet for permitting ingress of a feed fluid into the flow chamber, the arrangement being such that the membrane is at least partly supported in the flow chamber; at least one fluid outlet arranged in fluid communication with the flow chamber for permitting egress of fluid from the monitoring unit after having passed through the membrane; and an inspection window for permitting visual inspection of the membrane, the membrane being a semi-permeable membrane~~ a flow chamber having a feed fluid inlet for permitting ingress of a feed fluid into the flow chamber, a fluid permeable support member for supporting a semi-permeable test membrane in the flow chamber, the support member constituting a base portion of the flow chamber such that feed fluid entering the flow chamber passes at least in part through the support member, at least one fluid outlet arranged in fluid communication with the flow chamber for permitting egress of fluid from the monitoring unit after having passed through the test membrane; and an inspection window for permitting visual inspection of the semi-permeable test membrane, the inspection window being oriented substantially parallel to and spaced from the support member such that the flow chamber is defined intermediate the support member and the inspection window; the water purification system further being characterized therein that the monitoring unit is located in-line with the water purification system intermediate a

feed fluid tank and a membrane plant for monitoring fouling of a semi-permeable membrane in the water purification system.

44. (Currently amended) The use of a monitoring unit in a water purification system wherein the monitoring unit comprises a flow chamber having an inlet for permitting ingress of a feed fluid into the flow chamber, ~~the arrangement being such that a semi-permeable membrane is at least partly supported in the flow chamber a fluid permeable support member for supporting a semi-permeable test membrane in the flow chamber, the support member constituting a base portion of the flow chamber such that feed fluid entering the flow chamber passes at least in part through the support member;~~ at least one fluid outlet arranged in fluid communication with the flow chamber for permitting egress of fluid from the monitoring unit after having passed through the ~~test membrane; and an inspection window for permitting visual inspection of the semi-permeable test membrane, wherein the monitoring unit is located in-line with the water purification system and the operating conditions of the water purification system are simulated in the monitoring unit placing the semi-permeable test membrane on the fluid permeable support member; and effecting at least partial passage of feed fluid through the test membrane to stimulate operating conditions of the water purification system in the monitoring unit.~~

45. (Currently amended) The monitoring unit according to claim 10 wherein the monitoring unit further comprises at least a second semi-permeable test membrane adjacent the semi-permeable test membrane, and the spacer means provides a flow space between the adjacent test membranes and the support member.

46. (Currently amended) The monitoring unit according to claim 11 wherein the spacer means is a feed-side spacer located on top of the semi-permeable test membrane.